

Investigation of Effect of High, Short Duration Temperatures on Fiber Graphitization and Resulting Property Changes in 3D Woven TPS Preforms During Entry Trajectories, Phase I

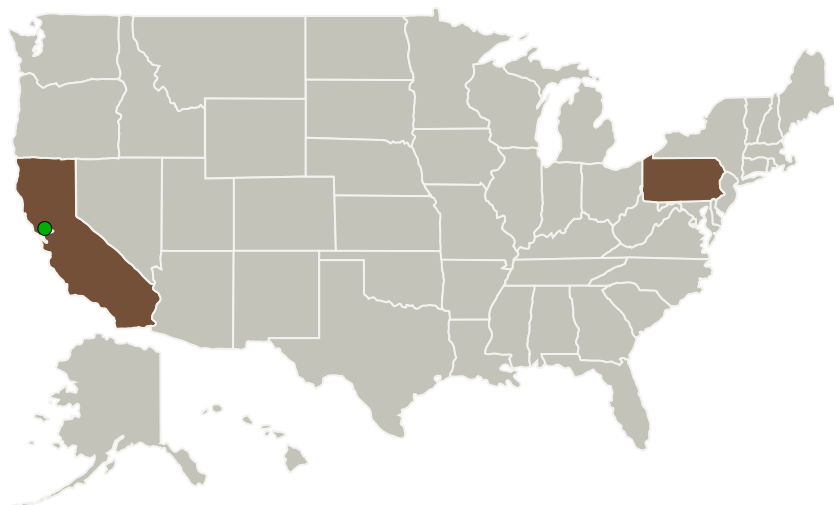
Completed Technology Project (2015 - 2015)



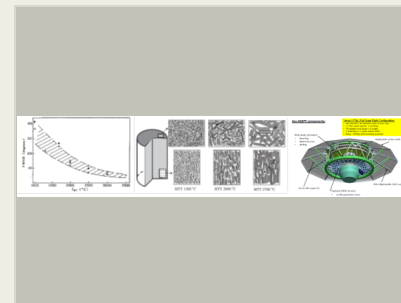
Project Introduction

To address the need for low-ballistic coefficient aeroshells with minimal impact on vehicle weight, NASA is investigating flexible thermal protection system (TPS) options. These designs typically consist of a flexible three-directional (3D) woven carbon cloth that can be stowed during flight and deployed on command to serve as a semi-rigid aeroshell during atmospheric entry. For some planned entry trajectories, the woven TPS is subjected to short duration, but extremely high heat flux levels. Since current plans call for the use of as-received non-heat treated carbon fibers in the WTPS, MR&D aims to investigate whether exposure to high temperature, short duration temperatures alters the graphitic microstructure and thus the properties of PAN-based carbon fibers.

Primary U.S. Work Locations and Key Partners



| Organizations Performing Work | Role | Type | Location |
|-------------------------------------|-------------------------|-------------|---------------------------|
| Materials Research and Design, Inc. | Lead Organization | Industry | Wayne, Pennsylvania |
| ● Ames Research Center(ARC) | Supporting Organization | NASA Center | Moffett Field, California |



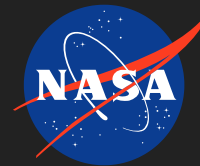
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Primary U.S. Work Locations

California

Pennsylvania

Project Transitions



June 2015: Project Start



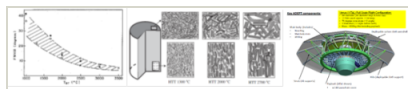
December 2015: Closed out

Closeout Summary: Investigation of Effect of High, Short Duration Temperatures on Fiber Graphitization and Resulting Property Changes in 3D Woven TPS Preforms During Entry Trajectories, Phase I Project Image Integrated into compression pads on Orion Module. Led to GCD Adaptive Deployable Entry and Placement Technology (ADEPT).

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139138>)

Images



Briefing Chart Image

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(<https://techport.nasa.gov/image/131912>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Materials Research and Design, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

Brian J Sullivan

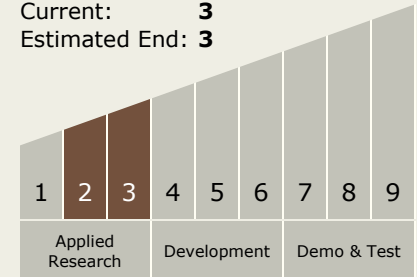
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Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX09 Entry, Descent, and Landing
 - └ TX09.4 Vehicle Systems
 - └ TX09.4.5 Modeling and Simulation for EDL

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System